

Executive Summary

Impacts to Water Quality

Pollutant sources fall into two general categories: point sources and nonpoint sources. Most often the source is based on the predominant land use in a watershed. Many point sources were removed from the Chowan River due to the Nutrient Sensitive Water (NSW) management strategy that was implemented in 1982. The NSW management strategy also resulted in municipal wastewater treatment plants (WWTP) converting to land application. Many unknown sources can impact water quality. However, agriculture, forestry, failing septic systems, altered hydrology, and runoff from land application of wastewater sites have all been identified as potential sources of nutrients impacting water quality in the basin.

Agriculture

In NC, approximately 29 percent of the land use in the Chowan River basin is identified as agriculture. Excess nutrients, pesticides, herbicides, bacteria, and sediment are often associated with agricultural activities. In the Chowan River basin, significant efforts have been made to reduce nitrogen and phosphorus loads originating from agricultural land through the installation of best management practices (BMPs). Between July 2010 and June 2020, more than \$1.2 million of state cost share funds has been spent in the basin on both agriculture and urban BMPs to protect water quality. Several practices have also been installed using funds available through programs managed by the USDA Natural Resource Conservation Service (NRCS).

As of May 2020, there are 40 permitted animal feeding operations (AFOs) in the Chowan River basin. All are permitted swine operations. Waste treatment from these operations typically includes a liquid waste treatment lagoon and application of liquid to vegetated spray fields. If not effectively utilized by vegetation (i.e., applied at agronomic rates), nutrients produced by animals can enter surface waters by atmospheric deposition, groundwater, and stormwater runoff. NCDEQ has regulatory authority over swine and cattle operations that use dry or liquid manure waste management systems and poultry operations that use a liquid waste management system (i.e., spray irrigation). These permitted animal facilities are inspected annually.

Most poultry operations, however, produce dry-litter poultry waste that typically falls under the deemed permitted category (15A NCAC 02T .1303) and do not require an NPDES or state permit. Operations that fall into this category are only inspected if a complaint is filed. Because information about the location, number of birds, amount of dry-litter poultry waste produced, and the location, surface area and application rate on which the dry-litter poultry waste is applied is unknown, determining the extent of potential impacts from dry-litter poultry operations to water quality is difficult to assess. Additional information is needed about the location of deemed permitted poultry operations and land application sites (both on farm and off farm) to assist DWR in establishing new monitoring stations to assess potential nutrient impacts to aquatic ecosystems and water quality. Based on data available through the USDA Census of Agriculture, the overall number of farms and the land area utilized for farming operations in Bertie, Chowan, Gates, Hertford and Northampton counties has declined since 2007, but the number of birds has increased in Bertie, Gates, and Hertford counties.

Approximately 29 percent of the land use in the North Carolina portion of the Chowan River basin is identified as agriculture. Excess nutrients, pesticides, herbicides, bacteria, and sediment are often associated with agricultural activities. To understand how agriculture has changed over the past 10 years, the USDA, National Agricultural Statistic Service's (NASS) [Census of Agriculture](#) was reviewed for the counties located entirely or partially in the North Carolina portion of the Chowan River basin. Per the 2017 Census of Agriculture, a total of 959 farm operations are operating on a total of 510,698 acres (798 mi²) in Bertie, Chowan, Gates, Hertford, and Northampton counties. This is a decrease from what was reported in the 2007 Census of Agriculture when 1,153 total farms were operating on a total of 532,071 acres (831 mi²). The total number of acres identified as cropland has increased from approximately 355,000 acres in 2007 to just over 372,000 acres in 2017 while pastureland and woodland has declined. Livestock inventory numbers have also changed over the last 10 years with the number of cattle and hogs decreasing while poultry inventory and number of poultry farm operations increased (USDA, 2017).

As of May 2020, there were 40 permitted swine operations in the Chowan River basin. Animal operations are defined under General Statute as feedlots that have more than 250 swine, 100 confined cattle, 75 horses, 1,000 sheep, or 30,000 confined poultry with a liquid waste management system. Most poultry operations in North Carolina, however, use a dry waste management system. Poultry operations with a dry waste management system are referred to as dry litter poultry operations. Dry litter poultry operations are deemed permitted and are not required to register or obtain a permit from DWR.

For permitted animal operations, a Certified Animal Waste Management Plan (CAWMP) is incorporated into the permit issued by DWR. Changes to the CAWMP are kept on the farm and reviewed annually by DWR during inspections. Records related to nutrient management for deemed permitted animal operations are kept on the farm as well but are not submitted to or reviewed by DWR. To better understand where potential sources may be impacting water quality in the Chowan River basin, information about the location of deemed permitted animal operations and where manure is being land applied could help DWR adapt the basinwide stream monitoring program and identify new water quality monitoring stations. Stream monitoring data has historically been a valuable piece of information in understanding and addressing nutrient-related impacts to water quality including recreational use, ecological integrity, commercial use, and quality of life for citizens living in the basin. **DEQ will continue to work collaboratively with federal, state, and local agencies as well as stakeholders in the basin to identify information sharing opportunities to target water quality monitoring and BMP implementation throughout the basin.**

Between July 2010 and June 2020, more than \$1.2 million of state cost share funds has been spent in the basin on both agriculture and urban BMPs to protect water quality. Several practices have also been installed using funds available through programs managed by the USDA Natural Resource Conservation Service (NRCS). Soil and water technicians along with the Albemarle Resource Conservation and Development Council, Inc. (ARCD) are continually working with agricultural operations to identify areas to implement nutrient and sediment reducing BMPs as well as identifying how best to redesign drainage from agricultural fields to reduce the amount and speed at which stormwater runoff enters a waterbody. BMPs that target nutrient reduction and sediment removal should continue to be prioritized and implemented throughout the basin.

Agriculture Best Management Practices (BMPs) and Waste Management Recommendations:	Participants
<p>Current rules and regulations do not require poultry operations that produce dry-litter poultry waste to obtain an NPDES or state permit. Because information about the location, number of animals, amount of dry litter poultry waste produced, or fields on which the dry litter poultry waste is applied is unknown, determining the extent of potential impacts from dry litter poultry operations to water quality is difficult to assess. Additional information is needed about the location of poultry operations and land application sites statewide in order for DWR to establish new monitoring stations to assess potential nutrient impacts to aquatic ecosystems and water quality. To obtain additional information about the location of poultry operations and land application sites, NCDEQ should evaluate existing regulations and potential partnerships for information sharing to identify and address potential water quality impacts from dry litter poultry waste. General Assembly NC Department of Environmental Quality DWR – Animal Feeding Operations Branch Public Stakeholders and Non-Profits</p>	<p>General Assembly NC Department of Environmental Quality DWR – Animal Feeding Operations Branch Public Stakeholders and Non-Profits</p>
Pollution Sources in the Chowan Basin and Albemarle Sound Recommendations:	Participants
<p>Understanding all potential pollution sources in the basin is critical to addressing impacts to water quality (i.e. increasing organic nitrogen, resurgence of harmful algal blooms). Potential sources of pollution include agriculture, biosolids, forestry, point sources, septic systems, stormwater, and ground water.</p> <p>To better understand where potential sources may be impacting water quality in the Chowan River basin, information about the location of deemed permitted animal operations and where manure is being land applied could help DWR adapt the basinwide stream monitoring program and identify new water quality monitoring stations. Stream monitoring data has historically been a valuable piece of information in understanding and addressing nutrient-related impacts to water quality including recreational use, ecological integrity, commercial use, and quality of life for citizens living in the basin. To do this, DEQ will continue to work collaboratively with federal, state, and local agencies as well as stakeholders in the basin to identify information sharing opportunities to target water quality monitoring and BMP implementation throughout the basin.</p>	<p>NC Department of Environmental Quality DWR Animal Feeding Operations Branch USDA Natural Resources Conservation Service (NRCS) NCDA&CS Division of Soil and Water Conservation (DSWC) County Soil and Water Conservation Districts (SWCD) North Carolina Farm Bureau (NCFB) Public Stakeholders and Non-Profits</p>

Water Use and Demand Recommendations:	Participants
<p>To ensure that future water supply needs can be met and to identify conflicts or problems that need to be resolved, information about water use needs to be collected from all water users.</p>	<p>DWR – Water Supply Planning Branch NC DEQ – Public Water Supply Section DWR – Basin Planning Branch NC Department of Agriculture & Consumer Services NC Farm Bureau United States Department of Agriculture</p>
<p>Establish a statewide water withdrawal permitting program. A statewide water withdrawal permitting program would allow DWR the ability to better manage water resources in the state.</p>	<p>General Assembly NC Department of Environmental Quality Water Supply Planning Branch</p>
<p>DWR needs to understand surface water and groundwater withdrawal volumes in the Chowan River Basin to answer questions about future water supply needs, to identify conflicts or problems that may result when too much water is being withdrawn, or how to manage water supplies under drought conditions. Understanding how water is being used in the basin will also help state and county engineers or planning managers plan for future growth and long-term sustainability, ensure commercial, industrial, agriculture and drinking water users are accounted for and that those uses are protected, and allow for better management during drought conditions. DWR will continue to work collaboratively with federal, state, and local agencies as well as stakeholders in the basin to identify information sharing opportunities to understand and protect water use for all users in the Chowan River basin.</p>	<p>DWR - Water Supply Planning Branch NC DEQ – Public Water Supply Section DWR - Basin Planning Branch NCDA&CS Agricultural Statistics – Environmental Statistics (Agriculture Water Use Survey) NC Farm Bureau United States Department of Agriculture</p>

Chapter 1 Chowan Basin Overview

1.6 Nonpoint Source Pollution

Nonpoint source pollution (NPS) is defined to mean “any source of water pollution that does not meet the legal definition of “point source” in Section 502(14) of the Clean Water Act (CWA)” (US EPA, 2020). NPS can result from any number of activities and land uses. Construction and land clearing activities, agriculture, golf courses, mining operations, solid waste disposal sites, urban landscapes, and on-site wastewater treatment systems (septic systems) all contribute to NPS and can add sediment, nutrients, bacteria, heavy metals, oil, and grease to a waterbody. NPS is difficult to monitor and account for. DWR works with several state and local agencies to identify potential NPS and the types of activities that may be impacting water quality in the area, but data gaps exist. These unknowns include, but are not limited to, the amount of fertilizers, pesticides, herbicides, and dry-litter animal waste applied to land, as well as the level at which these same pollutants may be impacting groundwater and air quantity and eventually reaching surface waters through baseflow or atmospheric deposition.

There are several programs in place through various organizations that protect water resources from NPS. Many include funding for best management practices (BMPs) that can reduce the amount of sediment, nutrients, and bacteria entering a waterbody as well as protect streambanks, reduce erosion, and manage waste. More information about these programs can be found in the Statewide, Regional and Local Initiatives chapter (Chapter 6).

Best management practice (BMP) is defined as “a structural or nonstructural management-based practice used to singularly or in combination to reduce point source or nonpoint source inputs to receiving waters in order to achieve water quality protection goals” (15A NCAC 02B .0202).

1.6.1 Agriculture

Approximately 29 percent of the land use in the North Carolina portion of the Chowan River basin is identified as agriculture (Table 1-3). Excess nutrients, pesticides, herbicides, bacteria, and sediment are often associated with agricultural activities. In the Chowan River basin, significant efforts have been made to reduce nitrogen and phosphorus loads originating from agricultural land through the installation of BMPs. Between July 2010 and June 2020, more than \$1.2 million has been spent by the Soil and Water Conservation Districts (SWCDs) through various cost share programs managed by the North Carolina Department of Agriculture & Consumer Services (NCDACS) Division of Soil and Water Conservation (DSWC) to install BMPs throughout the basin. Several practices have also been installed using funds available through programs managed by the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). A list of practices that have been installed in the basin can be found in the Statewide, Regional and Local Initiatives chapter (Chapter 6).

To understand how agriculture has changed over the past 10 to 15 years, the USDA, National Agricultural Statistic Service’s (NASS) [Census of Agriculture](#) was reviewed. The USDA publishes the Census of Agriculture every five years. The data collected by and reported in the census provide an overview of agricultural operations on a national, state, county or county equivalent scale to show the importance and value of agriculture to a particular region, evaluate historic agricultural trends to formulate policies and develop programs, identify and allocate local and national funds for agricultural programs (USDA, 2017). The data can be queried at the state, county or watershed scale. Because the watershed scale

includes portions of VA, agriculture data was queried to the county scale for counties located in the Chowan River basin. This included Bertie, Chowan, Gates, Hertford, and Northampton counties.

Per the 2017 census of agriculture, 959 farm operations are operating on 510,698 acres (798 square miles) in Bertie, Chowan, Gates, Hertford, and Northampton counties. The number of farm operations and the total acreage have decreased since 2007. The number of acres identified as cropland has seen a slight increase since 2007 while pastureland and woodland declined (Table 1-4).

Animals are reported as the number of animals in a production contract or by inventory in the census. Inventory is what was measured as of December 31 of the census year. Per the 2017 census of agriculture, the poultry inventory increased between 2007 and 2012, but then dropped between 2012 and 2017. Bertie County has the highest inventory followed by Hertford (Table 1-5). The number of cattle operations increased slightly between 2012 and 2017, but the number of animals decreased. The number of hog operations also increased between 2012 and 2017 as did the number of animals. This increase, however, is associated with small operations with less than 250 animals, and therefore, do not require a permit from the Animal Feeding Operations (AFO) Program.

As of May 2020, there are 40 permitted animal operations in the Chowan River basin (Figure 1-4). All are permitted swine operations. A table of permitted animal feeding operations as well as a general overview of animal feeding operations can be found in the Permitted and Registered Activities chapter (Chapter 7). More information can also be found on the Animal Feeding Operations (AFO) Program's [website](#). A more detailed review of how the number of animals has changed over time can be found in Appendix V-III.

Poultry operations are deemed permitted in North Carolina. Operations that are deemed permitted have fewer animals than the state requires to obtain a permit or have a waste management system that does not require a state or federal permit. Most poultry operations have dry-litter poultry waste systems and do not require a state or federal permit. Owners or operators of dry-litter poultry waste facilities are, however, required to adhere to rules set forth under 15A NCAC 02T .1303 and [General Statute 143-215.10C](#), which include minimum stream setbacks, land application rates, soil analysis, and recordkeeping. Because information about the location, number of animals, amount of dry-litter poultry waste produced and fields on which the dry-litter poultry waste is applied is unknown, determining the extent of potential impacts from dry-litter poultry waste to water quality is difficult to assess. Often, information about these facilities is restricted due to federal rules and regulations under the USDA. Additional information is needed about the location of poultry operations and land application sites statewide in order for DWR to establish new monitoring stations to assess potential nutrient impacts to aquatic ecosystems and water quality. To obtain additional information about the location of poultry operations and land application sites, DEQ should evaluate existing regulations and partnerships for identifying and addressing potential water quality impacts from dry-litter poultry waste.

Approximately 29 percent of the land use in the North Carolina portion of the Chowan River basin is identified as agriculture (Table 1-3). Excess nutrients, pesticides, herbicides, bacteria, and sediment are often associated with agricultural activities. To understand how agriculture has changed over the past 10 to 15 years, the USDA, National Agricultural Statistic Service's (NASS) [Census of Agriculture](#) was reviewed. The USDA publishes the Census of Agriculture every five years. The data collected by and reported in the census provide an overview of agricultural operations on a national, state, county, or county equivalent scale to show the importance and value of agriculture to a particular region. It also helps evaluate historic

agricultural trends to formulate policies, develop programs, and identify and allocate local and national funds for agricultural programs (USDA, 2017). The data can be queried at the state, county, or watershed scale. Because the watershed scale includes portions of VA, agriculture data was queried at the county scale for counties located entirely or partially within the Chowan River basin. This includes Bertie, Chowan, Gates, Hertford, and Northampton counties.

Per the 2017 Census of Agriculture, a total of 959 farm operations are operating on a total of 510,698 acres (798 mi²) in Bertie, Chowan, Gates, Hertford, and Northampton counties. This is a decrease from what was reported in the 2007 Census of Agriculture when 1,153 total farms were operating on a total of 532,071 acres (831 mi²). The total number of acres identified as cropland has increased from approximately 355,000 acres in 2007 to just over 372,000 acres in 2017 while pastureland and woodland has declined (Table 1-4).

Livestock inventory numbers have also changed over time. Per the 2017 Census of Agriculture, the poultry inventory increased between 2007 and 2012 from 9.5 million birds (chickens, broilers) on 114 farms to 11.4 million birds (chickens, broilers) on 132 farms. In 2017, the total number of birds decreased by 400,000 birds (11 million chickens, broilers) on a total of 133 farms (Table 1-5). Bertie County had the highest inventory followed by Hertford (Table 1-5). The livestock inventory for cattle and hogs decreased between 2007 and 2017, but in the case of hogs, information was withheld from one or more counties to avoid disclosing data from individual farms (Table 1-4) (USDA, 2017). Information that is obtained through the Census of Agriculture cannot be used for statistical purposes. It can only be used to compare changes over time. This makes it difficult to assess the extent of potential impacts animal operations and animal waste may have on water quality.

As of May 2020, there were 40 permitted animal operations in the Chowan River basin (Figure 1-4). All are permitted swine operations. Animal operations are defined under [General Statute 143.215.10B](#) as feedlots that have more than 250 swine, 100 confined cattle, 75 horses, 1,000 sheep, or 30,000 confined poultry with a liquid waste management system. All permitted animal operations are required to have a Certified Animal Waste Management Plan (CAWMP). The CAWMP is incorporated into the animal permit issued by DWR by reference and defines the fields to which waste is land applied, the crops to be grown, and other details about the operation. All waste must be applied at no greater than agronomic rates (an amount that can be used productively by the crops that are planted) ([General Statute 143-215.10C](#)). These permitted animal facilities are inspected annually.

Most poultry operations in North Carolina use a dry waste management system and are referred to as dry litter poultry operations. Such operations are deemed permitted under administrative code (NCAC) 15A NCAC 02T .1303. Owners or operators of dry litter poultry operations with 30,000 or more birds are required to adhere to rules set forth under 15A NCAC 02T .1303 and [General Statute 143-215.10C](#). These requirements include minimum stream setbacks, land application rates, soil and waste analysis, and recordkeeping. This information is included in a waste utilization plan (WUP) (also known as a nutrient management plan (NMP)). Producers are required to keep WUPs (NMPs) on file at the farm and do not have to submit the plan to DWR for review.

To better understand where potential nutrient sources may be contributing to the increases in organic nitrogen or the resurgence of harmful algal blooms in the basin, information on the location of potential nutrient sources (including dry litter poultry operations and manure hauling) could help DWR adapt the

basinwide stream monitoring program, identify new water quality monitoring stations, and help create a mass balance of nitrogen and phosphorus for the basin. Stream monitoring data has historically been valuable in understanding and addressing nutrient related impacts to recreational use, the economic well-being, and overall ecological integrity of the basin (Deerhake, personal communication). **DEQ will continue to work collaboratively with federal, state, and local agencies as well as stakeholders in the basin to identify information sharing opportunities to target water quality monitoring and BMP implementation throughout the basin.**

A table of permitted animal feeding operations as well as a general overview of animal feeding operations (AFO) can be found in the Permitted and Registered Activities chapter (Chapter 7). More information can also be found on the Animal Feeding Operations (AFO) Program's [website](#). A more detailed review of how the number of animals has changed over time can be found in Appendix V-III. It includes a review of animal inventory numbers for counties located entirely or partially in the basin in Virginia as well as North Carolina.

Figure 1-4 Animal Operation Permits Map

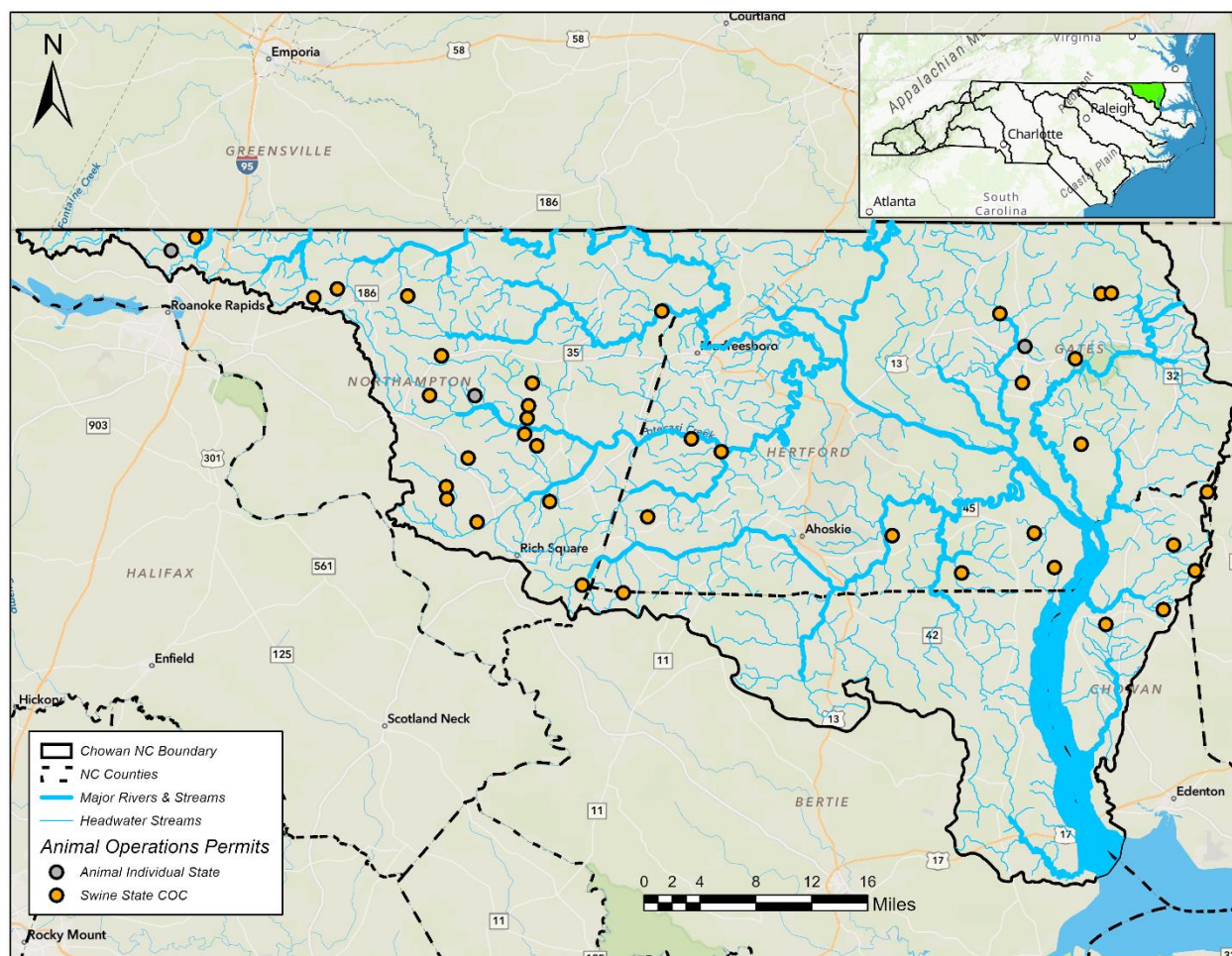


Table 1-4 USDA Census of Agriculture Data – Bertie, Chowan, Gates, Hertford and Northampton counties (2007, 2012, 2017)

	2007	2012	2017	2007	2012	2017
	Number of Operations			Number of Acres/Animals		
Number of Farms & Land Area	1,153	1,129	959	532,071	513,991	510,698
Land Use						
Total Cropland	849	870	722	354,632	351,288	372,265
Total Pastureland	324	243	193	13,625	12,738	10,331
Total Woodland	694	652	506	153,280	140,508	123,356
Harvested Cropland	704	710	589	341,186	338,520	341,036
Land in irrigated farms	145	115	79	166,909	142,720	119,587
Irrigated land	145	115	79	26,361	21,688	15,947
Livestock Inventory						
Cattle (including calves)	115	96	114	4,100	4,142	3,798
Hogs	46	45	57	292,637**	130,480**	133,084**
Chickens*	114	131	132	9,496,888	11,396,089	10,993,282
Crops						
Corn, Grain	366	263	240	64,711	35,961	40,192
Soybeans	495	525	466	100,189	119,854	131,062
Cotton	317	289	225	117,573	116,848	98,143
Tobacco	59	44	32	4,442	5,997**	6,910**
Peanuts	242	171	159	31,557	29,101	29,188
Wheat	178	287	162	22,505	47,864	30,860
Forage (hay, haylage, silage, greenchop)	61	48	45	4,855	2,520	2,636**
Fertilizers and Chemicals						
Cropland fertilized, except cropland pastured	616	585	495	305,945	289,554	244,064
Pastureland and rangeland fertilized	71	38	46	1,669	830	1,165
Manure	161	158	145	21,475	16,524	21,424
Organic fertilizer***	(NA)	(NA)	18	(NA)	(NA)	480
Acres treated with chemicals to control:						
Insects	476	490	393	249,455	241,083	300,818
Weeds, grass or brush	504	654	514	279,184	320,746	341,188
Nematodes	141	190	138	49,996	81,275	56,737
Diseases in crops and orchards	129	214	177	36,523	78,639	87,243
Growth, thin fruit, ripen or defoliate	256	213	221	96,981	94,841	102,629

*Broilers and other meat-type chickens.

** (D) Information withheld from one or more counties to avoid disclosing data for individual farms (USDA, 2017).

(NA) Information not available (USDA, 2017).

***This is a new item for 2017. These are the number of cropland or pastureland on which approved organic fertilizers were applied (USDA, 2017).

Table 1-5 USDA Census of Agriculture Data – Poultry Inventory 2007, 2012, 2017

County	2007	2012	2017	2007	2012	2017
	Number of Farms			Number of Animals (Poultry)*		
Bertie	51	63	67	5,251,485	6,083,898	5,863,743
Chowan	8	6	2	259,495	250,475	** (D)
Gates	12	17	20	826,791	1,125,530	1,474,245
Hertford	21	31	25	1,623,690	2,116,632	2,140,814
Northampton	22	14	18	1,535,427	1,819,554	1,514,480
Totals	114	131	132	9,496,888	11,396,089	10,993,282

*Broilers and other meat-type chickens.

** (D) Information withheld from one or more counties to avoid disclosing data for individual farms (USDA, 2017)

Soil and water technicians along with the Albemarle Resource Conservation and Development Council, Inc. (ARCD) are continually working with agricultural operations to identify areas to implement nutrient and sediment loading BMPs as well as identifying how best to redesign drainage from agricultural fields to reduce the amount and speed at which stormwater runoff enters a waterbody.

Soil and water technicians along with the Albemarle Resource Conservation and Development Council, Inc. (ARCD) are continually working with agricultural operations to identify areas to implement nutrient and sediment reducing BMPs as well as identifying how best to redesign drainage from agricultural fields to reduce the amount and speed at which stormwater runoff enters a waterbody. For nearly four decades, significant efforts have been made to reduce nitrogen and phosphorus loads originating from agricultural land through the installation of best management practices (BMPs). Over the past decade (July 2010 and June 2020) alone, more than \$1.2 million was spent by the Soil and Water Conservation Districts (SWCDs) through various cost share programs managed by the North Carolina Department of Agriculture & Consumer Services (NCDACS) Division of Soil and Water Conservation (DSWC) to install BMPs throughout the basin. Several practices have also been installed using funds available through programs managed by the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). A list of practices that have been installed in the basin can be found in the Statewide, Regional and Local Initiatives chapter (Chapter 6). BMPs that target nutrient reduction and sediment removal should continue to be prioritized and implemented throughout the Chowan River basin.

Chapter 8 Water Use and Availability

8.6 Future Considerations (Introduction)

While compliance with existing, statewide programs dealing with water resources management is reasonably effective at capturing major water withdraws and uses for most sectors, there are still data gaps that make it difficult for DWR to provide assistance across the state and ensure the long-term sustainability of water resources for all users. Understanding the amount and quality of ground water, ~~having accurate localized agricultural water use data~~, having long-term river and reservoir gages, and using long-term stream flow calculations are all critical to understanding how water is being used and how it can be sustained into the future. The following identifies topics for state leaders to consider when answering questions about water resources management.

8.6.2 ~~Localized~~ Agricultural Water Use Data

Agriculture is a major user of ground and surface water in the United States. According to the 2018 Agricultural Water Use Survey published by the NCDA&CS, water use in the Chowan River basin averages approximately 2.613 MGD with a withdrawal capacity that totals 49.189 MGD ([NCDA&CS, 2018](#)).

In the Chowan River basin, agricultural water use data is reported by county and watershed (HUC 8) in the 2018 Agriculture Water Use Survey. Data is available for three of the five counties located partially or entirely within the basin, but annual average daily groundwater withdrawn is not reported for one of the counties and annual average daily surface water withdrawn is not reported for two (Table 8-8). Similarly, annual average daily ground water use is reported for both the Chowan (HUC 03010203) and Meherrin (HUC 03010204), but annual average daily surface water use is only reported for the Chowan (Table 8-9). Due to federal and state confidentiality laws surrounding agricultural production, the data submitted as part of the Agriculture Water Use Survey is often aggregated. While aggregated data can be used to potentially answer statewide questions about the amount of water withdrawn, it is difficult to use in models to assess water use and availability or resolve impacts on water resources when new or additional withdrawals are made. ~~To answer questions regarding water availability and consumption rates, and for operations that rely heavily on water for irrigation, individual county or watershed scale data can help plan for future growth and allow for better management during drought conditions.~~ To answer questions regarding water availability, consumptive rates, crop irrigation, and drinking water supplies, complete data sets by either county or watershed can help plan for future growth, long-term sustainability, and allow for better management during drought conditions.

Table 8-8 Water Use County Summary (NCDA&CS, 2018)

County	Number of Unique Operations ¹	Annual Average Daily Ground (MGD) ²	Annual Average Daily Surface (MGD) ²	Daily Withdrawal Capacity (Ground and Surface) (MGD) ³
Gates	9	*	0.295	*
Hertford	12	0.148	*	*
Northampton	19	0.254	*	20.677

* one operation is greater than 60% of the total or less than 3 operations reported

¹ represents the unique number of operations with withdrew surface or groundwater

² represents the average across all days of the year

³ includes ground and surface water

Table 8-9 Water Use Hydrologic Unit Code (HUC) Summary (NCDA&CS, 2018)

HUC	Number of Unique Operations ¹	Annual Average Daily Ground (MGD) ²	Annual Average Daily Surface (MGD) ²	Daily Withdrawal Capacity (Ground and Surface) (MGD) ³
03010203	26	0.343	2.164	40.915
03010204	10	0.107	*	8.275
Total	36	0.449	*	49.189

* one operation is greater than 60% of the total or less than 3 operations reported

¹ represents the unique number of operations with withdrew surface or groundwater

² represents the average across all days of the year

³ includes ground and surface water

8.6.5 Identifying Data Gaps

North Carolina General Statute §143-355 requires DWR to assure the availability of adequate supplies of water to protect public health and support economic growth. Water supply planning and management requires a basic understanding of both the available water resources and all the demands being placed on those resources. Strides have been made with existing statewide programs to capture water withdrawal from all classes of water users, but data gaps exist. Consequently, these data gaps do not allow DWR to accurately report the amount of water being withdrawn statewide.

Collecting water use information from water users in all sectors is needed to fill in data gaps and allow DWR the ability to identify conflicts or problems that need to be resolved. Complete data sets are also needed to effectively plan, monitor, and manage water resources in North Carolina to ensure future water supply needs can be met. Working collaboratively across all state and federal agencies that have an interest in water resources could help identify and fill in some of the data gaps and identify regional concerns and challenges. ~~Small-scale water use data, however, is critical to solving local and regional issues.~~ Being able to report more completely about water use in the state would add value and more certainty in answering questions about water availability, giving businesses, industries, and citizens more assurance that water needs can be met now and in the future.